

### **DETAILED ACTION**

*This is a first action on the merits for the application having filing date of 4/10/07*

#### ***Drawings***

1. The drawings are objected to under 37 CFR 1.83(a) because figure 3 fails to show numeral 46 that denotes a ventilation outlet as described in the specification on page 20, second paragraph. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 31, 43-46, 50, and 53-57 are rejected under 35 U.S.C. 102(b) as being anticipated by Mizuno et al. (U.S.P.N. 5,187,344).

Regarding claim 31, Mizuno discloses a method for treating gases (col.1, lines 52-55 and col.3, lines 64-67), comprising impurities (considered the halogenated organic compounds described in col.1, lines 53-55), in which the gas at substantially atmospheric pressure (see Table at top of column 5, where the pressure of the reaction is conducted at 1 atmosphere, i.e., atmospheric pressure) is subjected to a radiofrequency inductively coupled plasma discharge (col.2, lines 66-67 and col.3, lines 50-52).

Regarding claim 50, Mizuno discloses a system (for example, see figure 3) for treating gases by plasma (col.1, lines 56-59 and col.3, lines 63-67), comprising means for (this phrase is considered to invoke paragraph <sup>6th</sup> and is equivalent to container 67 that holds halogenated organic compound 68 as shown in figure 3) producing a gas to be treated at a pressure substantially equal to atmospheric pressure (see Table at top of column 5, where the pressure of the reaction is conducted at 1 atmosphere, i.e., atmospheric pressure) and means for (this phrase is considered to invoke paragraph <sup>6th</sup>

and is equivalent to plasma torch 1 as shown in figure 3) producing radiofrequency plasma.

Regarding claim 53, Mizuno further teaches means for (this phrase is considered to invoke paragraph 6<sup>th</sup> and is equivalent to the coolant passage in nozzle 3 for circulating a coolant such as water or oil through the passage for cooling the nozzle as described in col.4, lines 49-51) cooling the means for producing radiofrequency plasma (figure 3:1).

Regarding claim 43, Mizuno teaches that the treated gas being argon gas containing hydrofluorocarbon gas (col.3, lines 63-66) where the hydrofluorocarbon gas is, for example, chlorofluorocarbon (col.1, lines 11-13).

Regarding claim 44, Mizuno teaches that the discharge comprising at least one temperature zone above 5000 K (col.2, lines 5-6; 10,000 °C equals 10273.2 K).

Regarding claim 45, Mizuno teaches that water is also added (col.4, lines 4-7).

Regarding claim 46, Mizuno teaches (Table in column 5) that the throughput of treated gas (considered argon) being about 40 L/min which is equal to 2.4 cm<sup>3</sup>/h.

Regarding claim 54, the RF power supply mentioned in the Table of column 5 in Mizuno, is capable of generating a current at a frequency of between about 50 KHz and about 200 MHz.

Regarding claim 55, Mizuno teaches that the means for producing a gas to be treated at a pressure substantially equal to atmospheric pressure comprising pumping means (figure 3:69).

As to the limitation that the outlet of the pumping means is at a pressure substantially equal to atmospheric pressure; Mizuno teaches (Table in column 5) that the pressure within torch is 1 atmosphere. Based on those teachings, one recognizes that the pressure at the outlet of tube 64 that is connected to mixer 66 and pump 69, is necessarily equal to 1 atmospheric pressure.

Regarding claim 56, Mizuno teaches a reactive element (figure 1:26, 27, and col.4, lines 34-40) for reacting the compounds resulting from the plasma treatment for their destruction.

Regarding claim 57, Mizuno discloses a container (67 is considered as the reactor device as shown in figure 3) having an internal volume that produces hydrofluorocarbon gas (col.3, lines 63-66), and further comprising a system (figure 3:1) for treating the hydrofluorocarbon gas.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 32-33, and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno et al. (U.S.P.N. 5,187,344) as applied to claim 31, and further in view of Ohkawa (U.S.P.N. 6,303,007).

Regarding claims 32-33, Mizuno fails to describe that the coupling to the discharge being of the transverse electric inductively coupled type or H type, and also fails to teach that the coupling to the discharge being of the E type.

Ohkawa discloses a plasma torch (figure 1:12) for treating waste material, which can be either liquid or solid (col.4, lines 15-21) where an azimuthal TE electric (considered as E type) field is created (col.3, lines 23-25) since it results in having the waste material vaporized and ionized to thereby create the plasma discharge (col.4, lines 17-22). In addition, Ohkawa further shows (figure 2:44 and 12) that the TE electric field is lying across (considered transverse, col.5, lines 47-49) the inner space of plasma torch 12. It would have been obvious to one of ordinary skill in the art at the time

of the invention to further provide the method in Mizuno with an azimuthal TE electric field since it results in having the waste material vaporized and ionized to thereby create the plasma discharge as explained by Ohkawa (col.4, lines 17-22).

Regarding claim 35, Mizuno fails to disclose frequency values for the generated plasma.

Ohkawa discloses a plasma torch (figure 1:12) for treating waste material, which can be either liquid or solid (col.4, lines 15-21) where it is known that in order to generate an azimuthal electric field, a microwave frequency value is taken, only as an example, to be 2.45 GHz (col.2, lines 12-15; 2.45 GHz=2450 MHz) so that a skin depth of about 1cm is obtained. Based on those teachings, if a skin depth of less than/more than 1cm are needed then one would recognize employing various different frequency values including 50 KHz or about 200 MHz. As such, using various different frequency values is considered a matter of optimizing the result-effective variable (frequency value) that is accomplished through routine experimentation.

It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with an azimuthal TE electric field since it results in having the waste material vaporized and ionized to thereby create the plasma discharge as explained by Ohkawa (col.4, lines 17-22).

Regarding claims 40-42, Mizuno fails to teach using a torch that includes refractory material, such as ceramic or alumina; and also fails to teach using a torch that includes metallic material.

Ohkawa discloses a plasma torch (figure 1:12) for treating waste material, which can be either liquid or solid (col.4, lines 15-21) where the plasma torch includes refractory material, such as a ceramic lining (figure 2:40, and col.5, lines 24-27) which helps shield the metal wall (figure 2:38) from heat losses in the cavity of plasma torch (figure 2:12). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with an azimuthal TE electric field since it results in having the waste material vaporized and ionized to thereby create the plasma discharge as explained by Ohkawa (col.4, lines 17-22).

8. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno et al. (U.S.P.N. 5,187,344) as applied to claim 31, and further in view of Kawakami et al. (U.S.P.N. 5,038,713).

Mizuno fails to describe the type of the plasma discharge.

Kawakami discloses a microwave plasma treating apparatus that is suitable for forming a deposited film and etching an object (col.1, lines 5-9) where a stable electric discharge E-H tuner is generated (col.9, lines 5-6) in order to provide a stable electric discharge with effective utilization of the microwave power (col.4, lines 31-32 and lines 43-45). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with the E-H tuner so that a stable electric discharge is provided with effective utilization of the microwave power as explained by Kawakami (col.4, lines 31-32 and lines 43-45).

9. Claims 36 and 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno et al. (U.S.P.N. 5,187,344) as applied to claims 31, 50, and further in view of Trassy (U.S.P.N. 6,207,924).

Regarding claims 36 and 51, Mizuno fails to disclose inside diameter values for the tube of the plasma torch.

Trassy discloses an inductive plasma torch (figure 1) having a tube (figure 1:10) with an internal diameter on the order of 25 mm in order to produce a plasma torch of low power (col.2, lines 50-53). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with a tube having an internal diameter of 25 mm so that a plasma torch of low power can be produced as explained by Trassy (col.2, lines 50-53).

Regarding claim 52, Mizuno fails to teach that the plasma torch includes silica material.

Trassy discloses an inductive plasma torch (figure 1) that includes non-cooled silica (col.2, lines 50-51) since such material is considered to contribute having a plasma torch of low power (col.2, lines 50-53). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with a plasma torch that includes non-cooled silica since such material is considered to contribute having a plasma torch of low power as explained by Trassy (col.2, lines 50-53).



**10.** Claims 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno et al. (U.S.P.N. 5,187,344) as applied to claim 31, and further in view of Kurosawa et al. (U.S.P.N. 5,818,581).

Regarding claim 37, Mizuno fails to teach that the plasma torch includes a silica glass material.

Kurosawa discloses a plasma torch (figure 1:2) having a coil for applying an RF power to an ambient atmosphere for analyzing and detecting elements in a sample (col.2, lines 25-31) where the plasma torch includes silica glass material (col.3, line 4) since with such a combination of structures results in having a method and apparatus that is capable of analyzing an element with a high sensitivity and a high accuracy (col.2, lines 8-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with a plasma torch that includes silica glass material since with such a combination of structures results in having a method and apparatus that is capable of analyzing an element with a high sensitivity and a high accuracy as explained by Kurosawa (col.2, lines 8-10).

Regarding claim 38, Mizuno discloses a torch (figure 3:1) having double walls (the unlabeled space between cylindrical tube 2 and the walls of nozzle 3 as shown in figure 3) where a cooling liquid is circulated within the torch (col.4, lines 49-52).

As to the limitation of circulating the cooling liquid between the two walls; Mizuno teaches circulating cooling water or oil through a passage in nozzle 3, where one would recognize that circulating the cooling liquid in nozzle 3 does include circulating the

cooling liquid between the two walls in order to prevent the possibility of having a melting or deformation of nozzle 3 (col.4, lines 47-49).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with a cooling-liquid circulation step between the double walls of plasma torch 1 in order to prevent the possibility of having a melting or deformation of nozzle 3 (col.4, lines 47-49).

11. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno et al. (U.S.P.N. 5,187,344) in view of Kurosawa et al. (U.S.P.N. 5,818,581) as applied to claim 37, and further in view of Trassy (U.S.P.N. 6,207,924).

Mizuno fails to disclose power values for operating the plasma torch.

Trassy discloses an inductive plasma torch (figure 1) that is operated at a power value less than 4 kW in order to produce a plasma torch of low power (col.2, lines 50-53). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with a power operating step having a value less than 4 kW in order to produce a plasma torch of low power as explained by Trassy (col.2, lines 50-53).

12. Claims 47-49 and 58-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuno et al. (U.S.P.N. 5,187,344) as applied to claims 31, 57, 50, and further in view of Imahashi (U.S.P.N. 6,284,668).

Regarding claims 47-49, Mizuno teaches treating gases that includes halogenated organic compounds (col.1, lines 10-13) that are known to have been emitted from various industrial processes into the atmosphere (col.1, lines 15-27).

Those halogenated organic compounds have serious adverse effects on the environment.

Mizuno fails to provide examples of such industrial processes. However, one of ordinary skill in the art would readily recognize that processes related to the semiconductor industry also emit various organic compounds, that if not treated prior to emission into the atmosphere, they would cause adverse effects to the environment. It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with a gas treatment step for gases emitted from semiconductor industries in order to prevent serious adverse effects on the environment (col.1, lines 24-27).

Imahashi discloses a plasma polishing method in a semiconductor process (col.1, lines 8-12) where a target object, such as, an LCD substrate (considered as a process for producing display screens) is dry polished with plasma since such a process does not use a polishing solution (col.1, lines 11-12 and col.8, lines 26-27). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the method in Mizuno with an LCD plasma treatment step since using plasma prevents the use of a polishing solution as explained by Imahashi (col.1, lines 11-12).

Regarding claim 58, Mizuno fails to teach providing a reaction chamber forming part of a unit for treating semiconducting devices.

Imahashi discloses a plasma polishing method in a semiconductor process (col.1, lines 8-12) where a target object, such as, an LCD substrate (considered as a process for producing display screens) is dry polished with plasma since such a process

does not use a polishing solution (col.1, lines 11-12 and col.8, lines 26-27). In addition, Imahashi discloses a reaction chamber (figure 4:50) forming part of unit for treating semiconducting devices (col.1, lines 8-12) so that the plasma polishing apparatus can be constituted as one unit (col.6, lines 55-56). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the system in Mizuno with the plasma polishing apparatus since using plasma prevents the use of a polishing solution as explained by Imahashi (col.1, lines 11-12).

Regarding claim 59, Mizuno fails to teach providing a reaction chamber forming part of a unit for treating semiconducting devices having first means for pumping the reactor atmosphere.

Imahashi discloses a plasma polishing method in a semiconductor process (col.1, lines 8-12) where a target object, such as, an LCD substrate (considered as a process for producing display screens) is dry polished with plasma since such a process does not use a polishing solution (col.1, lines 11-12 and col.8, lines 26-27). In addition, Imahashi discloses a reaction chamber (figure 4:50) forming part of unit for treating semiconducting devices (col.1, lines 8-12) so that the plasma polishing apparatus can be constituted as one unit (col.6, lines 55-56). The reaction chamber (50) further includes first means for (this phrase is considered to invoke paragraph 6<sup>th</sup> and is equivalent to exhaust fan 58 as shown in figure 4) pumping the reactor atmosphere (col.6, lines 65-67 and col.7, lines 1-2). It would have been obvious to one of ordinary skill in the art at the time of the invention to further provide the system in Mizuno with

the plasma polishing apparatus since using plasma prevents the use of a polishing solution as explained by Imahashi (col.1, lines 11-12).

***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MONZER R. CHORBAJI whose telephone number is (571)272-1271. The examiner can normally be reached on M-F 9:00-5:30.

14. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. R. C./

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